



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,932	09/28/2005	Axel Endriss	R.305543	3755

2119 7590 10/13/2006
RONALD E. GREIGG
GREIGG & GREIGG P.L.L.C.
1423 POWHATAN STREET, UNIT ONE
ALEXANDRIA, VA 22314

EXAMINER

ROSENAU, DEREK JOHN

ART UNIT	PAPER NUMBER
2834	

DATE MAILED: 10/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/550,932	Applicant(s) ENDRISS, AXEL	
	Examiner Derek J. Rosenau	Art Unit 2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>9/28/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Multilayer Piezoelectric Actuator and Sensor.

Claim Objections

2. Claims 9, 10, and 18-27 are objected to because of the following informalities. The claim language of these claims is not clear, and while they could be interpreted more broadly, they have been interpreted in light of the specification and drawings. In claim 9, the language "when the cross section of the piezoelectric actuator is rectangular" is indefinite as it does not clearly define whether or not the cross section is rectangular or not, as this is simply a conditional statement. In claim 10, it is unclear what "various sensor piezoelectric layers of the sensor parts are located side by side in a plane transverse to the action direction." Based on the specification and drawings, it appears that this is intended to describe the two or three segments in a single layer of piezoelectric material, as shown in Figures 4 and 5. However, the terms "layers" is not commonly used to refer to segments that are side-by-side, but rather stacked. Also, in claims 10 and 18-22, the language "in the case of" is indefinite as it does not clearly define whether the corresponding elements are intended to be further limitations to the claims, as these are simply conditional statements. In claims 23-27, it is unclear if "connected in series" is intended to describe a mechanical or electrical connection. Again, from the specification and drawings, it would appear that it was intended to

Art Unit: 2834

describe a mechanical connection, and will be interpreted as such. Additionally, in claims 23-27, the "and/or" terminology is indefinite as it does not clearly define what applicant regards as the invention.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 8, 13, 23, and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Butcher et al. (US 5382865).

5. With respect to claim 8, Butcher et al. discloses a piezoelectric actuator (Fig 1), comprising: an actuator part (items A and C) including multilayer construction of piezoelectric layers (item 1) perpendicular to the action direction, with inner electrodes (item 2) which are located between the piezoelectric layers and which can be acted upon by an electrical actuator voltage (items 3 and 4) for actuating the piezoelectric actuator part via outer electrodes (Fig 1), and at least one sensor part (item B) including further piezoelectric layers with inner electrodes at which an electrical sensor signal proportional to the actuation of the piezoelectric actuator can be picked up via further electrodes (column 2, lines 35-54), the piezoelectric layer for the actuator part and the piezoelectric layers for the at least one sensor part being integrated in one component as a piezoelectric actuator in such a way that individual sensor piezoelectric layers are

located at predeterminable spacing or locations between the piezoelectric layers for the actuator part (Fig 1).

6. With respect to claim 13, Butcher et al. discloses the piezoelectric actuator according to claim 8, wherein the inner electrodes of the at least one sensor part are located in the corner region and are each contacted there by outer electrodes (Fig 1).

7. With respect to claim 23, Butcher et al. discloses the piezoelectric actuator according to claim 8, wherein a plurality of sensor elements connected mechanically in series are connected electrically in parallel (Fig 1); and a plurality of actuator elements mechanically connected in series are connected electrically in parallel (Fig 1).

8. With respect to claim 26, the claimed subject matter therein is the same as that of claim 23; therefore claim 26 is anticipated by Butcher et al. as in claim 23 above.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 9, 14, 18, 19, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher et al. in view of Heinz et al. (US 6765337).

11. With respect to claim 9, Butcher et al. discloses the piezoelectric actuator according to claim 8. Butcher et al. discloses electrically positive and negative outer electrodes of the actuator part (Fig 1), and electrically positive and negative outer

Art Unit: 2834

electrodes of the sensor part (Fig 1) are each mounted on diametrically opposite sides of the piezoelectric actuator (Fig 1).

Butcher et al. does not disclose expressly that when the cross section of the piezoelectric actuator is rectangular. However, it has long been held that it would have been obvious to a person of ordinary skill in the art to change the shape of the device as long as the device performs the same function as before (*In re Dailey and Eilers*, 149 USPQ 47).

Additionally, Heinz et al. teaches a piezoelectric actuator with a rectangular cross section (Figs 2A-2D), also including pairs of positive and negative outer electrodes mounted on diametrically opposite sides of the piezoelectric actuator (Figs 2A-2D).

At the time of invention, it would have been obvious to combine the rectangular cross section of Heinz et al. with the piezoelectric device of Butcher et al. for the benefit of providing a shape that can be easily and efficiently manufactured.

12. With respect to claim 14, the combination of Butcher et al. and Heinz et al. discloses the piezoelectric actuator according to claim 9. Both Butcher et al. and Heinz et al. disclose that the inner electrodes of the at least one sensor part are located in the corner region and are each contacted there by outer electrodes (Fig 1 of Butcher et al. and Figs 2A-2D of Heinz et al.).

13. With respect to claim 18, Butcher et al. discloses the piezoelectric actuator according to claim 13. Butcher et al. discloses a plurality of sensor parts (Fig 1).

Butcher et al. does not disclose expressly that the plurality of sensor parts have inner electrodes that are contacted in alternation by outer electrodes on different flanks of the corner region.

Heinz et al. teaches a piezoelectric actuator in which the plurality of actuator parts in which the inner electrodes are contacted in alternation by outer electrodes on different flanks of the corner regions.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the outer electrode arrangement of Heinz et al. with the piezoelectric device of Butcher et al. for the benefit of symmetry and uniform distributions of fields and stresses (column 5, lines 28-35).

14. With respect to claim 19, the claimed subject matter therein is the same as that of claim 18; therefore, claim 19 is unpatentable over Butcher et al. in view of Heinz et al. as in claim 18 above.

15. With respect to claim 27, the combination of Butcher et al. and Heinz et al. discloses the piezoelectric actuator according to claim 18. Butcher et al. discloses that a plurality of sensor elements connected mechanically in series are connected electrically in parallel (Fig 1); and a plurality of actuator elements mechanically connected in series are connected electrically in parallel (Fig 1).

16. Claims 10, 15, 20, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher et al. in view of Heinz et al. in view of Dibbern et al. (US 5552658).

17. With respect to claim 10, the combination of Butcher et al. and Heinz et al. discloses the piezoelectric actuator according to claim 9. Butcher discloses a plurality of sensor parts each individually contacted by outer electrode (Fig 1).

Neither Butcher et al. nor Heinz et al. disclose expressly that the various sensor piezoelectric layers of the sensor parts are located side by side in a plane transverse to the action direction.

Dibbern et al. teaches a piezoelectric actuator in which the various sensor piezoelectric layers of the sensor parts are located side by side in a plane transverse to the action direction (Fig 4).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the side by side arrangement of piezoelectric layers of Dibbern et al. with the sensor piezoelectric layers of the piezoelectric device of Butcher et al. as modified by Heinz et al. for the benefit of providing redundancy to the sensor piezoelectric layers.

18. With respect to claims 15, 20, and 24, the claimed subject matter therein is the same as that of claims 14, 18, and 23 respectively; therefore claims 15, 20, and 24 are unpatentable over Butcher et al. in view of Heinz et al. in view of Boyd as in claims 14, 18, and 23 as above.

19. Claims 11, 16, 21, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher et al. in view of Heinz et al. in view of Kawabata et al. (US 6097134).

Art Unit: 2834

20. With respect to claim 11, the combination of Butcher et al. and Heinz et al. discloses the piezoelectric actuator according to claim 9.

Neither Butcher et al. nor Heinz et al. disclose expressly that both the outer electrodes of the actuator part and the outer electrodes of the at least one sensor part are located side by side on two diametrically opposite sides of the piezoelectric actuator. However, it has long been held that it would have been obvious to a person of ordinary skill in the art to shift the location of the parts of a device, as long as the device performs the same function as before (*In re Japiske*, 86 USPQ 70).

Additionally, Kawabata et al. teaches a piezoelectric actuator in which both the outer electrodes of the actuator part and the outer electrodes of the at least one sensor part are located side by side on two diametrically opposite sides of the piezoelectric actuator (Fig 19 and column 8, lines 11-12).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the outer electrode arrangement of Kawabata et al. with the piezoelectric device of Butcher et al. as modified by Heinz et al. for the benefit of reducing the amount of outer electrode material required and to reduce one of the cross sectional dimensions of the device.

21. With respect to claims 16, 21, and 25, the claimed subject matter therein is the same as that of claims 14, 18, and 23 respectfully; therefore, claims 16, 21, and 25 are unpatentable over Butcher et al. in view of Heinz et al. in view of Dibbern et al. as in claims 14, 18, and 23 above.

Art Unit: 2834

22. Claims 12, 17, and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher et al. in view of Heinz et al. in view of Dibbern et al. in view of Kawabata et al.

23. With respect to claims 12, 17, and 22, the claimed subject matter therein is the same as that of claims 11, 14, and 18 respectfully; therefore, claims 12, 17, and 22 are unpatentable over Butcher et al. in view of Heinz et al. in view of Dibbern et al. in view of Kawabata et al. as in claims 11, 14, and 18 above.

Conclusion

24. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Uehara et al. (US 5278471) and Boyd (US 6346764) disclose piezoelectric actuators that include segmented actuator layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek J. Rosenau whose telephone number is 571-272-8932. The examiner can normally be reached on Monday thru Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on 571-272-2044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2834

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Derek J Rosenau
Examiner
Art Unit 2834

DJR
10/3/06


DARREN SCHUBERG
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800